901B PG REG AN.

KEPCO LAB

POWER SUPPLY REGULATION ANALYZER

MODEL 901B

SERIAL .....

KEPCO LABORATORIES, INC.
131 - 38 Sanford Avenue
Flushing 55, New York

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KEPCO LABORATORIES, INC.
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POWER SUPPLY REGULATION ANALYZER

MODEL 901B

The Regulation Analyzer is designed to measure an applied DC voltage, the percentage change in the applied DC voltage, and the RMS ripple on the applied DC voltage of regulated and unregulated power sources.

SPECIFICATIONS:

DC VOLTAGE TEST RANGE: 1-3000 volts.

PERCENT REGULATION RANGES: Four sensitivity ranges are provided -

1 - 0.005% each side of null position. (DC test range is 10-3000 volts.)
Each division on the meter scale = 0.0002%.

2 - 0.05% each side of null position. (DC test range is 1-3000 volts.)
Each division on the meter scale = 0.002%.

3 - 0.5% each side of null position. (DC test range is 1-3000 volts.)
Each division on the meter scale = 0.02%.

4 - 5% each side of null position. (DC test range is 1-3000 volts.)
Each division on the meter scale = 0.2%.

RIPPLE VOLTAGE RANGE: 0-100 volts in eleven ranges -

0-1, 5, 10, 50, 100, 500 millivolts RMS.

0-1, 5, 10, 50, 100 volts RMS.

METERS:

Voltmeter - Three ranges: 0-300 volts; 0-1500 volts; 0-3000 volts; 2% accuracy.

This meter is provided for approximate measurement of the voltage output from the power supply under test.

Null and Percent Regulation Meter - Four ranges: 0.005%, 0.05%, 0.5%, and 5% each side of null position.

RMS Ripple Meter - Eleven ranges covering the ranges 0-1 millivolt full scale to 0-100 volts full scale; 2% accuracy.

CONTROLS:

Power on-off switch.

DC voltage divider network controls consist of four groups of precision resistors and one ten-turn potentiometer. This divider network is made up of resistors of 0.1% accuracy so that the voltage being measured can be accurately determined to 0.1%:

1000 V Selector switch covers the range 0-2000 V in two 1000 V steps.

100 V Selector switch covers the range 0-1000 V in ten 100 V steps.

10 V Selector switch covers the range 0-100 V in ten 10 V steps.

1 V Selector switch covers the range 1-11 V in ten 1 V steps.

The ten-turn potentiometer covers a range of 1 V, 1 MV per division on a precision ten-turn dial.

RMS Ripple switch (momentary contact).

DC Voltmeter Selector switch - Three ranges:

300 volts; 1500 volts; 3000 volts.

Percent Regulation Selector switch - Five position:

OFF; ±5%; ±0.5%; ±0.05%; ±0.005%.

Input Voltage Polarity switch.

Percent Regulation Amplitude control for external recording.

Percent Regulation Overload Reset switch.

Internal 10 volt Battery Calibrate and Read switch.

Internal 10 volt Calibrate control (locking type).

INPUT TERMINATIONS: Two shielded input connectors are mounted on the rear of the chassis, one for regulation measurement, the other for ripple measurement.

OUTPUT TERMINATIONS:

Oscilloscope Monitoring Terminals: A BNC connector is provided on the front panel for observing the ripple input to the RMS voltmeter. The high voltage DC is isolated from this connector by means of a 0.25 MF, 4 KV capacitor.

Regulation Output Terminals for External Recording: Two terminals are provided at the rear of the chassis. A recording type voltmeter can be connected to these terminals to continuously record the percent regulation.

POWER REQUIREMENTS: 105-125 volts, 60 cycles.

PRINCIPLES OF OPERATION OF PERCENTAGE REGULATION SECTION:

The voltage from the power supply under test is applied to the input of this unit. The approximate voltage is set up on the input DC voltage divider network selector switches. The voltmeter reads the applied DC voltage to within an accuracy of 2%. To measure the applied voltage precisely, the input DC voltage divider network switches and the ten-turn potentiometer are adjusted until a null is obtained on the percent regulation meter. The input DC voltage divider network is a constant current 1 milliampere divider network, dividing the input voltage down to the internal standard cell voltage. This voltage is compared with the standard cell voltage. The difference in the divided down voltage and the standard cell voltage

is applied to a "chopper". The chopped DC signal is then applied to an AC amplifier. The output of this AC amplifier is rectified, and applied to the percent regulation meter.

The percent regulation meter has four ranges:

±5%, ±0.5%, ±0.05%, and ±0.005%.

For the percent regulation ranges, ±5%, ±0.5% and ±0.05%, the applied voltage is compared with a 1.018 volt standard cell.

For the percent regulation range, ±0.005%, the applied voltage is compared with a 10 volt mercury cell battery.

RMS RIPPLE METER:

The RMS ripple meter is an AC electronic voltmeter.

PHYSICAL SPECIFICATIONS: This unit is designed for standard relay rack mounting or bench use. Height 8-3/4", width 19", depth 17". Panel height 8-3/4", width 19". Panel color Kepco standard gray hammertone.

OPERATING INSTRUCTIONS: The Kepco Model 901B Power Supply Regulation Analyzer is shipped with all tubes in place and is ready for operation.

OPERATING PROCEDURE:

1. Connect the input cable connectors from the analyzer to the power supply under test as indicated in the Inter-Connection Block Diagram, Drawing No. WD-901B-01.

2. Set the RMS ripple meter selector switch to the OFF position.

3. Set the percent regulation selector switch to the OFF position.

4. Set the voltmeter range switch to the appropriate voltage range.

5. Set the ground selector switch to either + ground or - ground

position, depending upon whether the + of the power supply under test is grounded or the - of the power supply under test is grounded. To obtain minimum ripple pick up in the leads from the analyzer to the power supply under test it is recommended that the power supply under test be grounded at the output terminals of the power supply.

CAUTION: IN CONNECTING THE INPUT CABLE FOR RIPPLE MEASUREMENTS ALWAYS CONNECT THE SHIELD OF THIS CABLE TO THE GROUND TERMINAL.

6. Turn on the power switch and wait approximately one minute for all circuits to reach equilibrium.

7. Determine the applied DC voltage to within approximately 5% by means of the meter on the power supply under test, or by means of an external meter. Set the input DC voltage divider network switches to correspond with the approximate input DC voltage.

8. Turn the percent regulation selector switch to the 5% position and adjust the input DC voltage selector switches until a null is obtained on the percent regulation meter.

If the deviation between the applied DC voltage and the input DC voltage as set up on the selector switches is greater than 5%, an overload relay will remove the input voltage from the voltage divider network. Should this occur adjust the input DC voltage divider network switches to correspond more closely with the applied DC voltage. Depress the overload re-set button to re-apply the input voltage to the divider network The overload re-set button may be held in momentarily to determine the

direction in which the input DC voltage selector switches deviate from the applied voltage.

After a null has been obtained on the 5% regulation scale the percent regulation range switch may then be switched to the 0.5% position and a null again redetermined as outlined above.

After a null has been obtained on the 0.5% position the percent regulation range switch may be switched to the 0.05% position providing the power supply under test is stable to better than ±0.05%. Adjust the input DC voltage divider network switches until a balance is again obtained using the procedure outlined above.

After a null has been obtained on the 0.05% position the percent regulation range switch may be switched to the 0.005% position providing the power supply under test is stable to better than ±0.005%. Adjust the input DC voltage divider network switches until a balance is again obtained using the procedure outlined above.

When the 0.005% scale is used the minimum voltage that may be applied to the input DC voltage divider network is 10 volts. When shifting from the 0.05% regulation position to the 0.005% position it is necessary to shift the X 10V and the X 1V input DC voltage selector switches one step counterclockwise so that the applied voltage corresponds with the red numerals.

After a null has been determined on the appropriate percent regulation range the absolute DC voltage may be read from the positions of the input DC voltage divider network switches and the ten-turn potentiometer. This is only true for the 5%, 0.5% and 0.05% regulation ranges. For the 0.005%

range it is necessary to determine the exact voltage of the 10 volt mercury cell reference as outlined in Paragraph #10 below. The deviation of the internal battery from 10.018 volts should be added to the voltage as read on the input DC voltage selector switches and the ten-turn potentiometer.

For determining the percent regulation of the power supply under test for varying line and load conditions, select the appropriate percent regulation range and make the corresponding measurements on the percent regulation meter.

9. Calibration of the 0.005% Regulation Range: Set the percent regulation switch in the OFF position. Press the internal battery switch to the CAL. position. Set the percent regulation switch to the 5% position and adjust the internal battery calibrate control until a null is obtained. Turn the percent regulation switch to the 0.5% position and again adjust the internal battery calibrate control until a null is obtained. Turn the percent regulation switch to the 0.05% position and again adjust the internal battery calibrate control until a null is obtained. It is necessary to calibrate this range when the mercury cell battery voltage changes.

10. To read the absolute value of the internal mercury cell battery used for the 0.005% range, turn the percent regulation switch to the OFF position. Set the input DC voltage divider network to 10 volts. Press the internal battery switch to the READ position, turn the percent regulation switch to the 5% position and adjust the X 1MV control until a null is obtained. Turn the percent regulation range switch to the 0.5% position and adjust the X 1MV control until a null is obtained. Turn the percent regulation range switch to the 0.05% position and adjust the X 1MV control until a null is obtained.

11. To read the RMS ripple on the applied DC voltage turn the RMS ripple range selector switch to the approximate range position and depress the PRESS TO READ switch. When changing range on the RMS ripple meter release the PRESS TO READ switch.

12. For external recording of the percent regulation two terminals are provided at the rear of the chassis. A percent regulation sensitivity control is provided adjacent to these output terminals to vary the amplitude of the percent regulation signal so that the full scale of the recording potentiometer corresponds with the full scale of the percent regulation meter.

MAINTENANCE: The components of the Model 901B Power Supply Regulation Analyzer have been selected and tested to provide long and trouble free operating life. The only service necessary should be the replacement of vacuum tubes. The location of the tubes is clearly marked on the chassis.

A maintenance manual will be available in the near future and will be furnished upon written request.

REPAIRS: Major repairs are usually handled by the factory. Under no circumstances should the instrument be returned to the factory without proper authorization and shipping instructions. In any correspondence with the factory concerning repairs, the type and serial number of the instrument must be given together with a description of the trouble encountered.

PARTS LIST - MODEL 901B

DRAWING S-901B-01

Input Circuit

BT1	- Standard Cell (1 volt)		
BT2	- Mercury Cell (5 volt)		
BT3	- Mercury Cell (5 volt)		
C6	- 0.25	MF	4000 WV
J1	- BNC Connector		
J2	- AN3102A-22-9P		
J3	- BNC Connector		
L2 thru L5	- Switch Solonoid, 12 V DC		
M1	- Meter, 0-1 MA DC (Special Scale)		
R1	- 1	K	10 turn Pot.
R2	- 1	K	3 turn Pot.
R10 thru R17	- 250	K	1/2 watt WW
R18 thru R23	- 500	K	2 watt
R24	- 300	K	1 watt
R48	- 1	K	1/2 watt WW
R49	- 9	K	1/2 watt WW
R50	- 100	Ohm	25 turn Trimpot
S3	- S. P. 6 Pos. Rotary Switch		
S4	- 12 P. 2 Pos. Rotary Switch		
S5	- S. P. 6 Pos. Rotary Switch		
S6	- 6 P. 5 Pos. Rotary Switch		
S7	- 8 P. 3 Pos. Spring Return Lever Switch		
S10 thru S13	- SPDT Vacuum Switch		
Z1	- 100 K/Step Resistance Decade		
Z2	- 10 K/Step Resistance Decade		
Z3	- 1 K/Step Resistance Decade		

PARTS LIST - MODEL 901B

DRAWING S-901B-02

C8	- 2	MF	600 WV
C9, 10, 24	- 0.1	MF	600 WV
C11, 12	- 0.25	MF	600 WV
C13, 14, 15, 16	- 0.1	MF	500 WV
C26	- 1000	MMF	2000 WV
C27	- 500	MMF	2000 WV
C28, 29	- .005	MF	2000 WV
C30	- 0.01	MF	1000 WV
GR1	- Germanium Diode 1N34A		
M2	- Meter, 50-0-50 UA DC (Special Scale)		
PL2	- Neon Pilot Light Assembly		
R3	- 5	K	2 watt Pot.
R4	- 1	Meg.	2 watt Pot.
R5	- 10	K	3 turn Helipot
R9	- 1	Meg.	1 watt
R25	- 100	K	1 watt
R26, 42	- 4.7	K	1/2 watt
R27, 35, 36, 40, 44	- 100	K	1/2 watt
R28	- 100	Ohm	1 watt
R29	- 10	Ohm	25 turn Trimpot
R30	- 4.5	K	1/2 watt WW
R31	- 450	Ohm	1/2 watt WW
R32	- 50	Ohm	1/2 watt WW
R33, 38, 39, 43	- 1	Meg.	1/2 watt
R34, 37, 41	- 10	K	1/2 watt
R45	- 220	Ohm	1 watt
R46	- 270	K	1/2 watt
R47	- 27	K	1/2 watt
R83	- 80	K	10 watt WW
R84, 85	- 470	K	1/2 watt
R86	- 240	K	1/2 watt
RL1	- 3PDT Relay		
RL2	- SPDT Relay		
RL3	- DPDT Relay		
S2	- D.P.N.O. Push-button Switch		
S4	- 12 P. 2 Pos. Rotary Switch		
S6	- 6 P. 5 Pos. Rotary Switch		
SC1	- 400 cy. DPDT Chopper		
SCD1	- 400 cy. Chopper Driver Assembly		

V8	- 12AX7
V9	- 12AX7
V10	- 12BH7
V11	- 6AW8
V12	- 12AX7

PARTS LIST - MODEL 901B

DRAWING S-901B-03

A. C. Voltmeter Amplifier

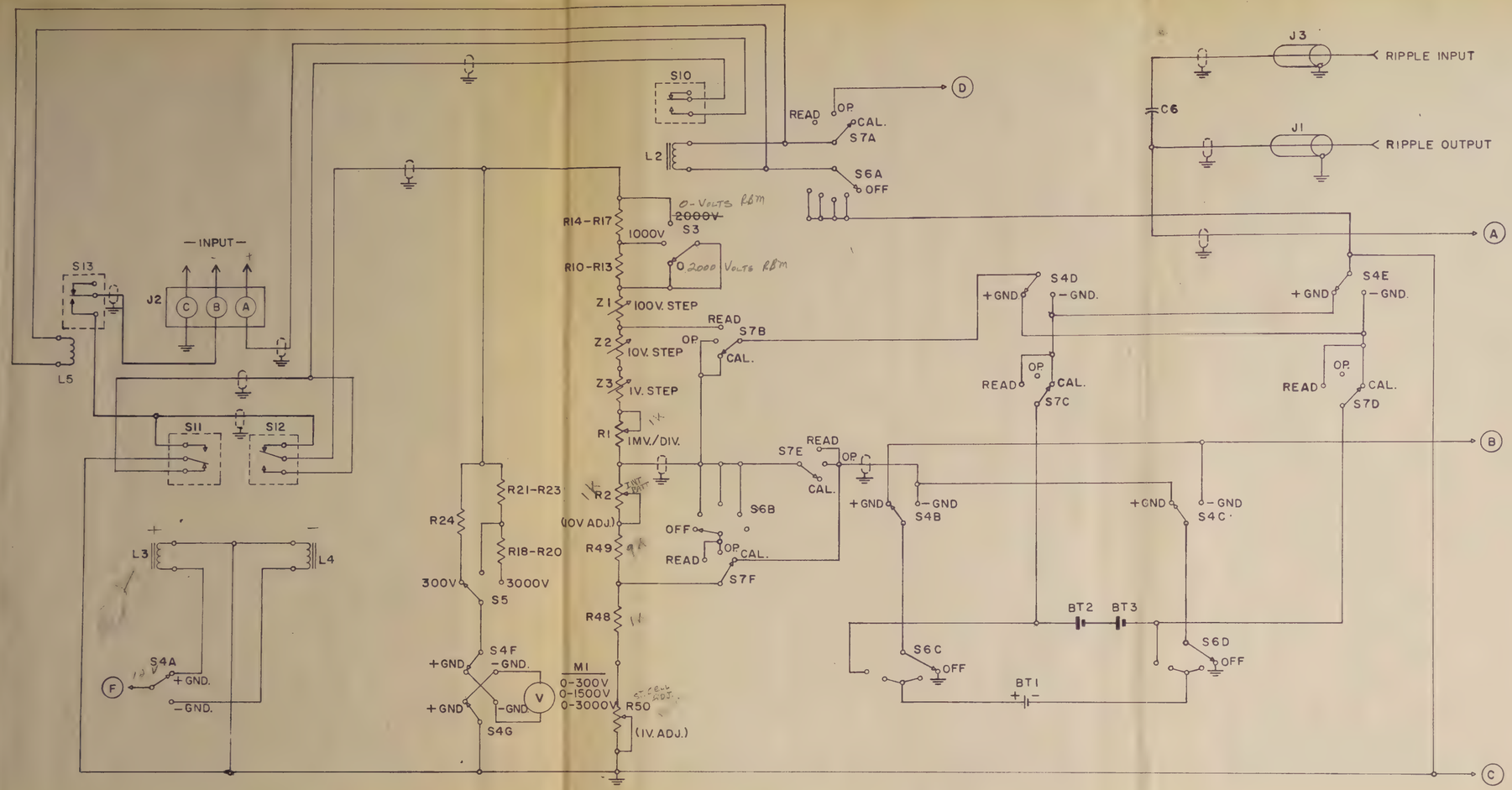
C7	- 2	MF	600 WV
C17	- 0.25	MF	600 WV
C18, C19	- 0.1	MF	500 WV
C20	- 500	MMF	2000 WV
~~C25~~	~~- .001~~	~~MF~~	~~2000 WV~~ Delete
M3	- Meter, 0-200 ~~MA~~ uA AC (Special Scale)		
R51	- 100	K	1/2 watt WW
R52	- 100	Ohm	1/2 watt WW
R53	- 4.7	K	1/2 watt WW
R54	- 40	K	1/2 watt WW
R55	- 5	K	1/2 watt WW
R56	- 4	K	1/2 watt WW
R57	- 500	Ohm	1/2 watt WW
R58	- 400	Ohm	1/2 watt WW
R59	- 100	Ohm	1/2 watt WW
R60	- ~~100~~ 220	Ohm	1/2 watt
R61	- 10	Ohm	25 turn Trimpot
R62	- 100	K	1 watt
R63	- 100	K	1/2 watt
R64	- 10	K	1/2 watt
R65	- 1	Meg.	1/2 watt
R66	- 100	K	1 watt
R67	- 220	Ohm	1/2 watt
R68	- 100	K	1/2 watt
R69	- 10	K	1/2 watt
R70	- 1	Meg.	1/2 watt
R71	- 2.2	K	1/2 watt
R72	- 10	K	1/2 watt
R73	- 1	K	1/2 watt
S8	- S. P. N. O. Mom. Toggle Switch		
S9	- 2 P. 12 Pos. Rotary Switch		
V6	- 6BA8		
V7	- 6AW8		

PARTS LIST - MODEL 901B

DRAWING S-901B-04

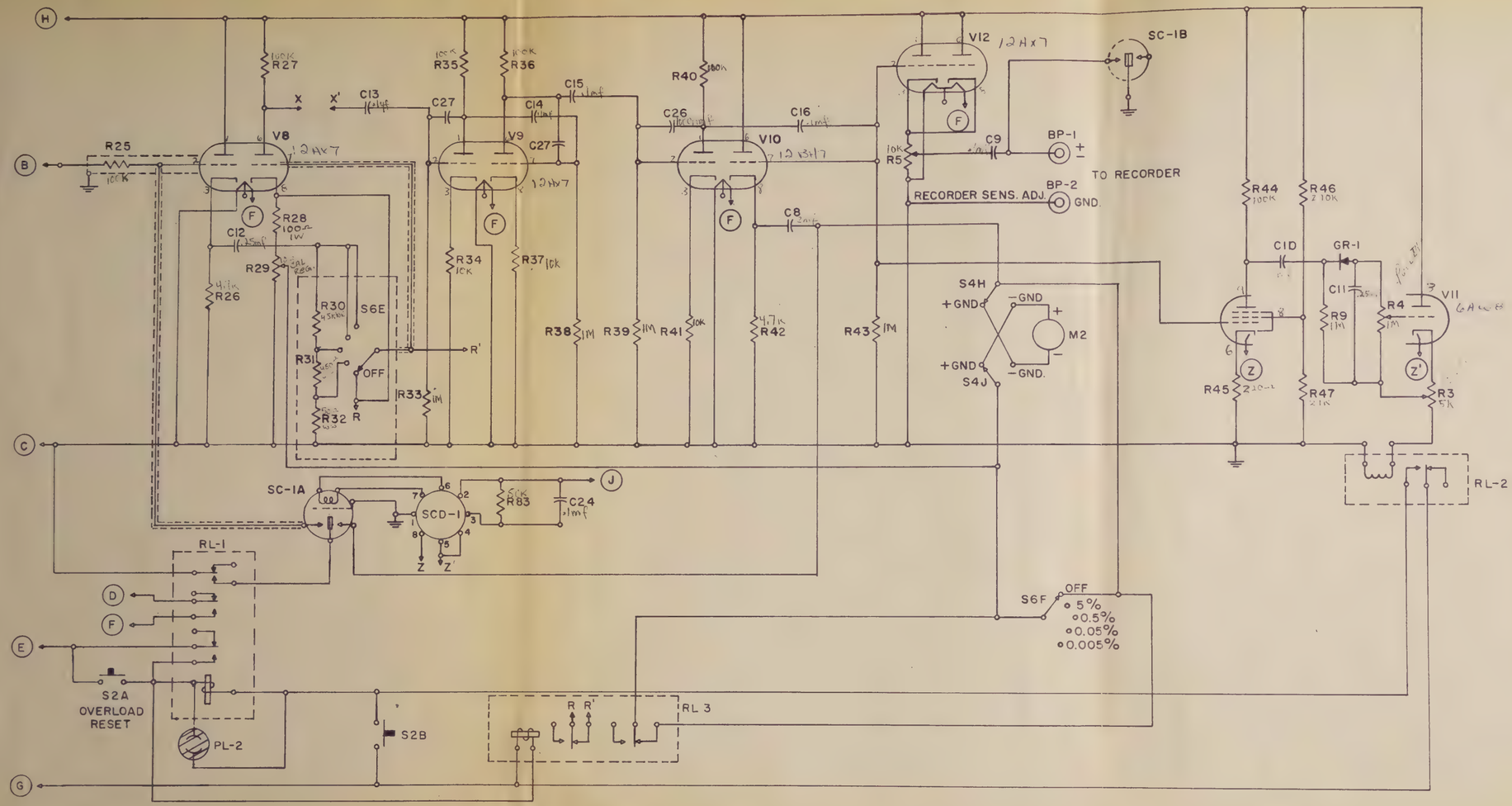
Power Supply Section

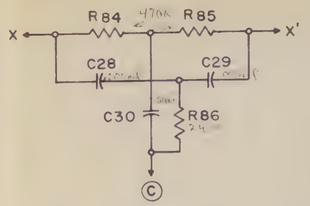
C1	- 8	MF	1000 WV
C2	- 8	MF	1000 WV
C3	- 1000	MF	25 WV
C4	- 1000	MF	25 WV
C5	- 4	MF	1000 WV
C21	- 500	MMF	2000 WV
C22	- 0.1	MF	600 WV
C23	- 0.25	MF	600 WV
F1	- 6 Amp. Fuse		
L1	- Kepco Choke #100-256		
PL1	- Neon Pilot Light Assembly		
R6	- 330	K	2 watt
R7	- 100	Ohm	1 watt
R8	- 1	Meg.	1 watt
R74	- 120	K	1/2 watt
R75	- 180	K	1/2 watt
R76	- 56	K	2 watt
R77	- 35	K	10 watt WW
R78	- 270	K	1/2 watt
R79	- 270	K	1/2 watt
R80	- 100	K	1/2 watt
R81	- 250	K	1/2 watt WW
R82	- 100	K	1/2 watt WW
S1	- SPST Toggle Switch		
SR1	- Silicon Rectifier 4JA411FB1AD1		
T1	- Kepco #100-664		
T2	- Kepco #100-673		
V1	- 5U4GB		
V2	- 5881		
V3	- 12AX7		
V4	- 6AW8		
V5	- 85A2		



LETTERS ENCLOSED IN CIRCLES DENOTE CONNECTIONS TO CORRESPONDING POINTS ON S-9018-02,03,&04.

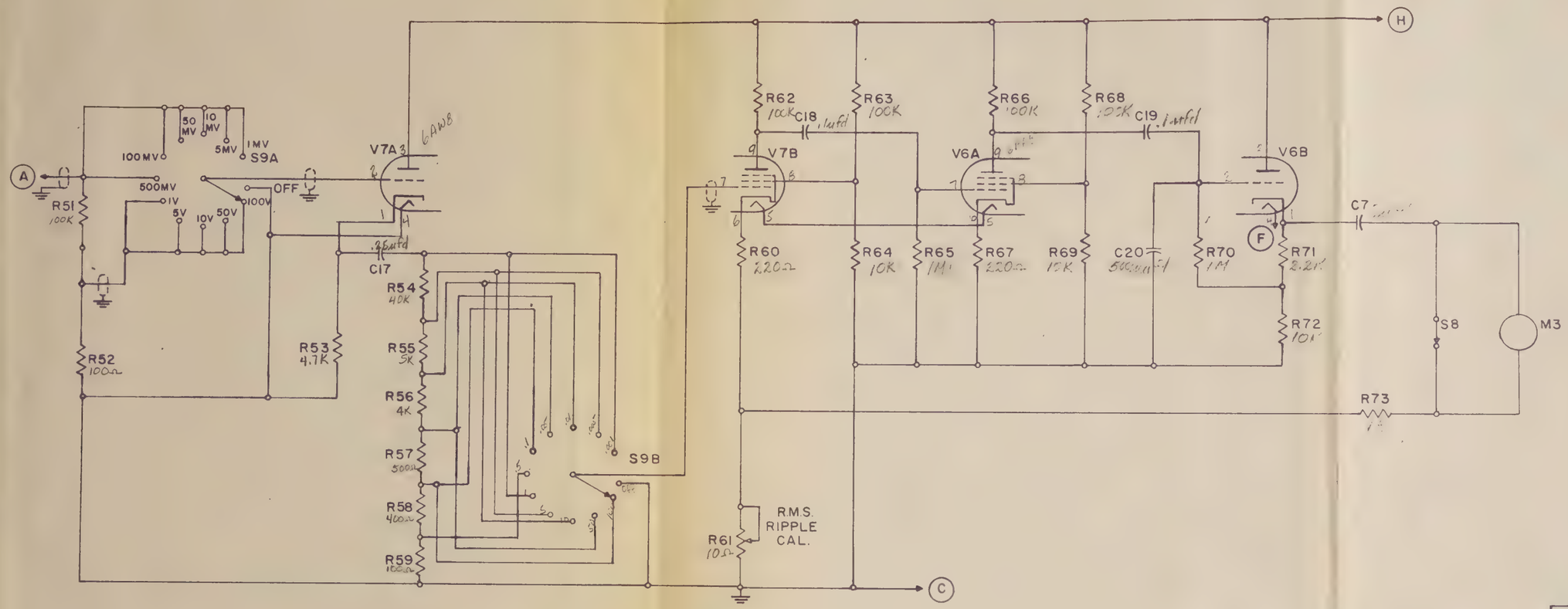
KEPCO LABORATORIES	
FLUSHING — NEW YORK	
ITEM: INPUT CIRCUIT	DES. B.C.
	APPD 5-27-57
MODEL 901B	DFTM W.S.
DWG. No. S-901B-01	CHKD J.R.G.





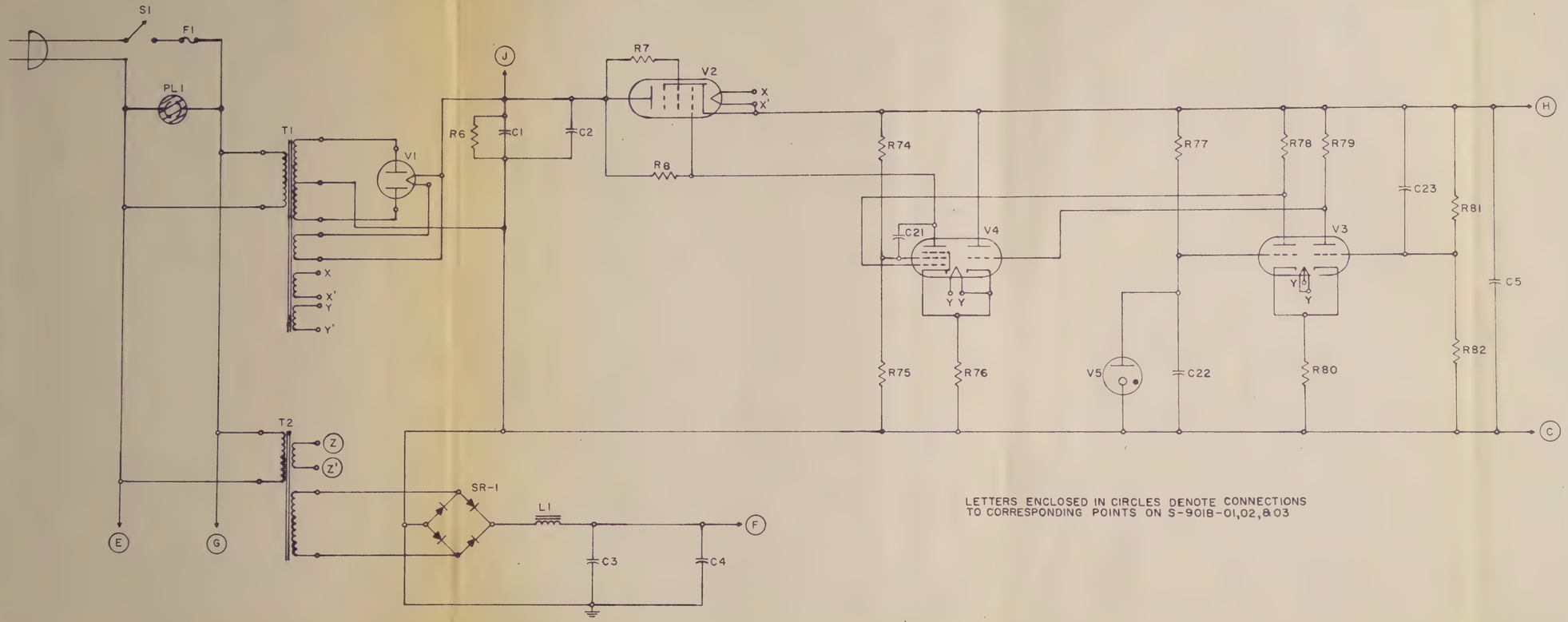
LETTERS ENCLOSED IN CIRCLES DENOTE CONNECTIONS TO CORRESPONDING POINTS ON S-9018-01,03,& 04.

KEPCO LABORATORIES	
FLUSHING	NEW YORK
ITEM: CHOPPER AMPLIFIER	DES. B.C.
	APP. 4-1-58
MODEL 9018	DFTM W.S.
DWG. No. S-9018-02	CHKD J.R.G.



LETTERS ENCLOSED IN CIRCLES DENOTE CONNECTIONS
TO CORRESPONDING POINTS ON S-901B-01,02,&04

KEPCO LABORATORIES	
FLUSHING NEW YORK	
ITEM A.C. VOLT METER AMPLIFIER	DES B.C.
	APPD 5-28-57
MODEL 901B	DFTM W.S.
DWG. No. S-901B-03	CHKD J.R.G.



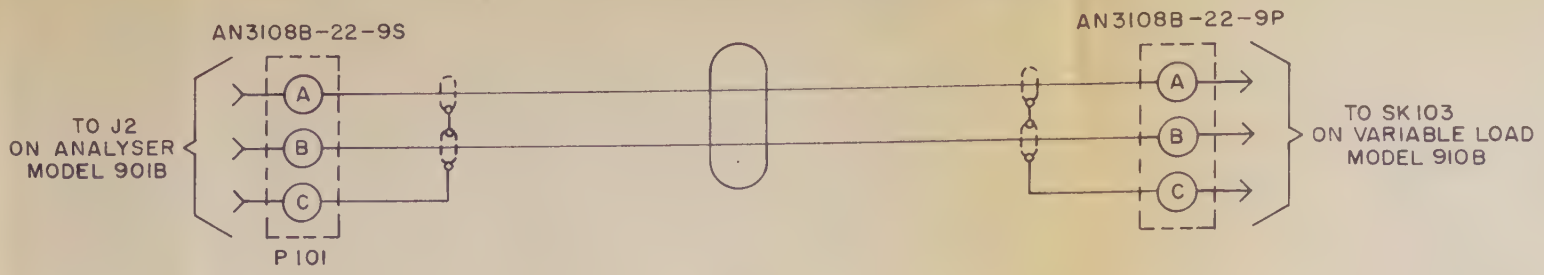
LETTERS ENCLOSED IN CIRCLES DENOTE CONNECTIONS TO CORRESPONDING POINTS ON S-9018-01,02,&03

KEPCO LABORATORIES

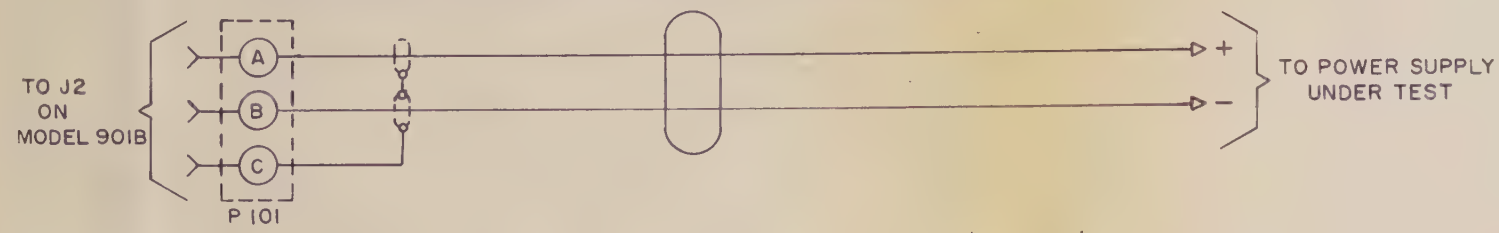
FLUSHING NEW YORK

ITEM: POWER SUPPLY SECTION	DES. B.C.
	APPD 5-28-57
MODEL 9018	DFTM W.S.
DWG. No. S-9018-04	CHKD B.C.

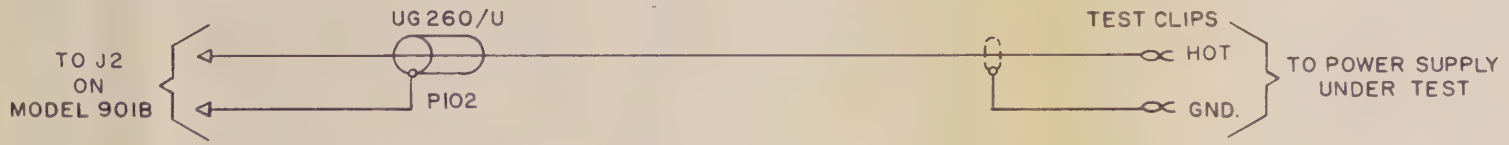
INPUT CABLE USED IN CONJUNCTION WITH MODEL 910B VARIABLE LOAD.



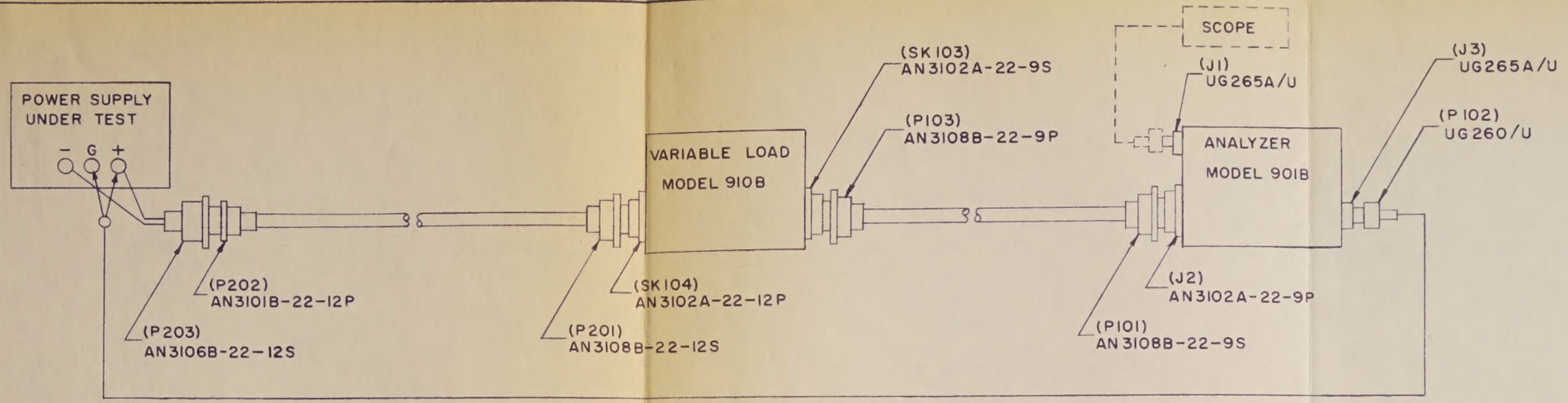
ALTERNATE INPUT CABLE FOR USE WHEN MODEL 901B IS USED ALONE.

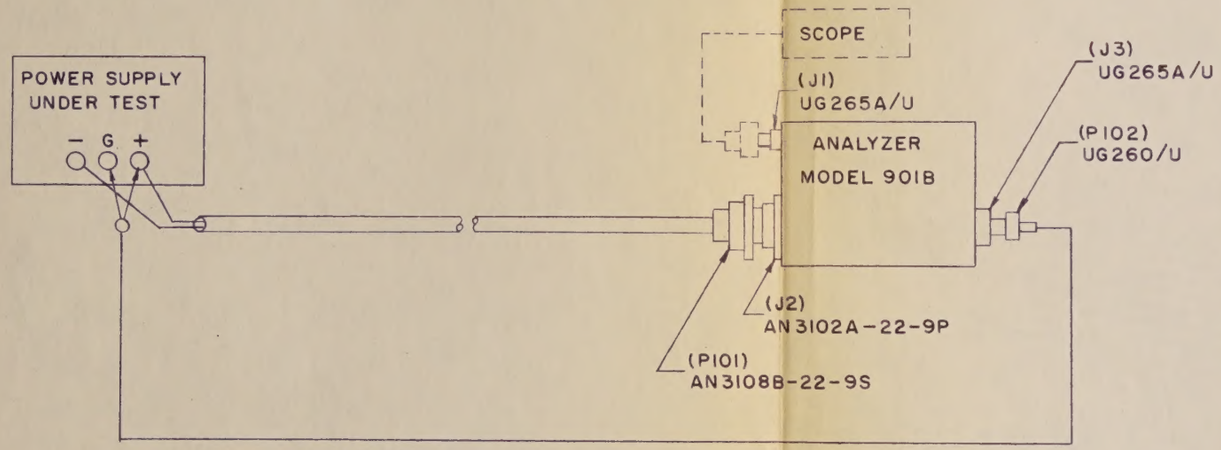


A.C. RIPPLE METER CABLE



KEPCO LABORATORIES	
FLUSHING NEW YORK	
ITEM CABLE SCHEMATIC	DES. B.C.
	APPD 7-26-57
MODEL 901B	DFTM W.S.
DWG. No. S-901B-05	CHKD J.R.G





KEPCO LABORATORIES		
FLUSHING NEW YORK		
ITEM: BLOCK DIAGRAMS	DES.	GROUP
	APPD.	POCKET
	DFTM. W.V.D.	FOLDER
MODEL 901B	CHKD. J.R.G.	ORIGINALS
DWG. NO. WD-901B-01	DATE 7-26-57	SHEET OF